NAVAL FIGHTERS NUMBER TWENTY ONE

CHANCE VOUGHT
V-173 AND XF5U-1
FLYING PANCAKES

V-173 AND XF5U-1 PROGRAM HIGHLIGHTS

7 MARCH 1939: V-173 blueprints submitted to the Navy.
7 APRIL 1939: Navy requests that NACA investigate the V-173 proposal.
11 JULY 1939: Navy requests that Vought build a flying model based on NACA wind tunnel tests.
15 AUGUST 1939: Vought proposes a full scale flying model.
2 OCTOBER 1939: Navy approves testing at NACA of 24" free-flying V-173 model.
6 MARCH 1940: NACA wind tunnel test results forwarded to Navy.
30 APRIL 1940: Based on wind tunnel tests ailevators are added to the V-173.
4 MAY 1940: Navy places contract for the V-173.
OCTOBER 1940: Aielron controls and adjustable stabilizers added to the V-173.
14 April 1941: VS-315 propeller drive system designs submitted to the Navy.
30 JULY 1941: Navy assigns serial number 02978 to the V-173.
15 SEPTEMBER 1941: V-173 ready for delivery to NACA for wind tunnel testing.
DECEMBER 1941: Wind tunnel tests conducted at NACA Langley.
19 JANUARY 1942: Navy requests Vought submit a proposal for two experimental fighters based on VS-315 specifications and successful V-173 wind tunnel tests.
10 FEBRUARY 1942: Navy requests 1/3 scale model of the VS-315 (XF5U-1).
MAY 1942: E. J. Greenwood assigned as project engineer to work with Zimmerman.
30 JUNE 1942: VS-315 informal proposal submitted to Navy.
10 SEPTEMBER 1942: Navy requests letter of intent.
17 SEPTEMBER 1942: Letter of intent issued for VS-315 (XF5U-1).
23 NOVEMBER 1942: First flight of V-173 made by Boone Guyton.
24 APRIL 1943: XF5U-1 propeller drive system approved by Navy.
3 JUNE 1943: R. H. Burroughs makes forced landing of V-173 on Lordship Beach.
7 JUNE 1943: XF5U-1 mock-up inspection.
6 AUGUST 1943 : Final XF5U-1 mock-up inspection.
22 OCTOBER 1943: V-173 modified with all-flying horizontal stabilizers after forced landing.
NOVEMBER 1943: Flapping prop blades proposed for XF5U-1.
31 DECEMBER 1943: CDR. Ramsey and LCDR. Booth fly the V-173.
18 FEBRUARY 1944: Vought submitted a proposal to modify the XF5U-1 propeller hubs.
28 MARCH 1944: Vought proposes to terminate V-173 contract and incorporate the V-173 program into the XF5U-1 contract.
13 MAY 1944: V-173 contract changed.
27 MAY 1944: Voughts final proposal for termination of V-173 contract and consolidation into the XF5U-1 contract.
18 JANUARY 1945: Vought requests permission to transport XF5U-1 to Muroc Dry Lake (Edwards AFB), California, for flight testing.
24 MARCH 1945: Vought requests contract amendment after auditing cost estimates.
13 April 1945: Vought requests reduction in flight and static test programs.
19 MAY 1945: Vought requests Navy waive V-173 final demonstrations and BIS trials.
26 MAY 1945: R. H. Burroughs makes forced landing on Mill River golf course.
20 AUGUST 1945: XF5U-1 rolled out with F4U-4 style four blade propellers.
17 MARCH 1947: XF5U-1 contract cancelled by the Navy.

INTRODUCTION

This book was created from manuscripts written by and provided by Art Schoeni public affairs official for Vought from 1953 to 1978. These writings have been published in; Aeroplane Monthly (Nov. & Dec. 1975), Air Classics (Vol. 11/8 Aug. 1975), and Historical Aviation Album (Vol. VIII). Two other good references on the Pancakes are Aeroplanes Vought by G. Moran and Air Enthusiast (Vol. 4/6 June 1973). The other major contributor to this book was Tommy Thomason who provided a modern view of the program and the kit reviews. The V-173 drawings were provided by Ed Clendenin of Eagle Talon models.

Anyone having photos or other information on this or any other naval or marine aircraft, may submit them for possible inclusion in future issues. Any material submitted will become the property of NAVAL FIGHTERS unless prior arrangement is made. Individuals are responsible for security clearance of any material before submission. **ISBN 0-942612-21-3**
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FRONT COVER - V-173 as seen from behind. (via Bob Lawson)
BACK COVER - Top, XF5U-1 33958 early in it's short career when it was fitted with F4U-4 style props. Bottom, front view of V-173 which shows the leading edge windows and air intakes and the silver undersurfaces. (via Bob Lawson)

CHANCE VOUGHT V-173 AND XF5U-1 "FLYING PANCAKES"

The V-173 with Boone Guyton at the controls during its third flight in December 1942 over the Vought plant at Stratford, Connecticut. Note absence of gear spats or fairings and early round national insignias. (via Skip Ruff)

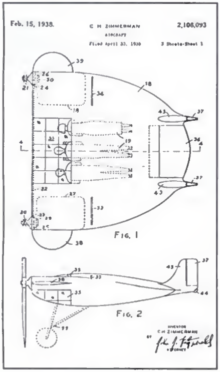
The "Flying Pancake", "Flying Flapjack", "Flying Saucer", and "Zimmer's Skimmer" were all names used to describe Charles H. Zimmerman's unorthodox V-173 and XF5U-1 aircraft. Two other descriptions; the world's fastest and slowest-flying airplane and the world's first vertical takeoff and landing airplane, might have been used to describe the XF5U-1 that was built but never flown. Zimmerman's brainchild was conceived and designed to do just that, but was never given the chance. The protracted development program and the advent of jet aircraft caused the cancellation of the project on 17 March 1947.

The "Flying Pancake's" designer, Charles Zimmerman, graduated from the University of Kansas in 1930 with a degree in electrical engineering. Included in his course of study was a class in introductory aeronautics which helped him secure a job with NACA (National Advisory Committee for Aeronautics) at their Langley Field facility. Before he got into the business of designing and building the Pancakes, Zimmerman made a name for himself by first solving the problem of a free-spinning wind tunnel and then developing a free-flight wind tunnel.

In a NACA design competition for a civilian lightplane in 1933, he designed a circular-wing aeroplane that was to fly at high speed and yet hover like a helicopter. The plane would utilize wingtip-mounted airscrews rotating in opposite direction to the wingtip vortices, thereby preventing their formation and increasing the aerodynamic efficiency. Initially two engines driving their own propellers were planned, but later both engines drove a common drive shaft for safety. His design won the competition with its aerodynamic excellence and sound engineering. However, NACA rejected the idea for further development because it was "too advanced". One of the runner-ups became the popular Ercoupe.

Although NACA shelved the idea, Zimmerman did not. With the help of two co-workers, Richard Noyes and

Charles H. Zimmerman, designer of the "Flying Pancakes".



1935 photo of the one-man, 7 foot span, wooden piloted flying model. The model was never flown due to engine sync problems.

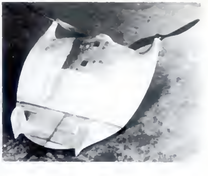
John McKeller, Zimmerman worked on the concept in off-duty hours. During 1934-35 several test models were built to try out flight characteristics. As originally planned, the little airplane was to carry three passengers lying prone to promote streamlining, changing to upright positions in flight. The idea was incorporated in a US patent procured by Zimmerman in 1938. The idea had been abandoned before then because of its marginal comfort.

One of the flying models Zimmerman built was a one-man, wooden flying machine with a seven foot wingspan and powered by two 25 h.p. Cleone engines from France. He and his associates never could get the two engines synchronized, and he turned to a 20 inch span rubber-band-powered model in 1936. The model performed as predicted and after NACA executives reviewed films of the tests, it was suggested that he try to interest private industry or the military in the concept. Zimmerman convinced Eugene E. Wilson, president of the United Aircraft Corporation, that the idea had merit, and he joined the Chance Vought Aircraft division in 1937.

In October 1938, Zimmerman attempted to interest the Army in a short range liaison-observation type aircraft designated V-170. The Army declined, and in November he tried to interest the Civil Aeronautics Authority with his V-171 design (a larger V-162). He tried the Army again in December with a V-172 attack-bomber version, which was again rejected.

Zimmerman constructed an electric-powered model, the V-162, which was operated by two pilots using remote control. Tests were run in a hangar, with the tethered airplane flying so well that the US Navy became interested and advanced research funds. The V-162 was hinged so that the rear quarter of the circular fuselage, including the two vertical rudders, acted as an elevator.

By 1939 drafting work, engineering design and aerodynamic studies were underway with Navy financing.



The electric powered proof-of-concept model, the V-162. The aft end of the model was hinged and included two vertical stabilizers. This model had no horizontal stabilizers, but these were added to the V-173.

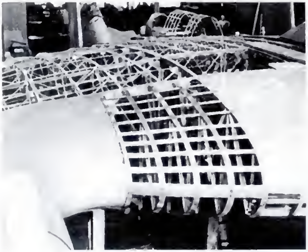
The prototype V-173 was constructed with standard wing fabric covering the entire plane, in an effort to save weight and money. Originally the V-173 had no horizontal outboard stabilizers, but model tests indicated that this idea was unsatisfactory and the "flying tail" (all-moveable tail) was developed. Two Continental A-80 engines, rated at 80 h.p. each, turned 16 foot 6 inch three-bladed propellers, although the original plan had called for two-bladed units. The stork-like fixed landing gear gave the plane a 22 degree nose-high ground angle.

The basic wing area and wing planform were the same for the V-173 and the XF5U-1. The wing area was 427 square feet, with the planform being derived from a circle 23 feet 4 inches in diameter by, in effect, sliding the tip sections forward relative to the root chord so that the quarterchord points were in line. The sections were symmetrical, NACA 0015, and there was neither twist nor dihedral in the wing.

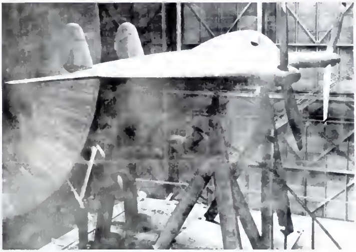
The major differences between the two planes were in weight and power. The V-173 weighed about 3050 pounds for most of its flights, giving it a power loading of 19.1 pounds per horse power. The high power loading was the major deficiency of the aircraft and the main cause of two forced landings it had during testing. The engines later installed in the XF5U-1 were Pratt & Whitney R-2000-7 of 1,350 h.p. each. To

achieve greater performance it was planned to install more powerful Pratt & Whitney R-2000-2(D) engines of 1,600 h.p. each. With these engines the 16,802 pound (loaded) aircraft would have had a power loading factor of 5.2 pounds per horse power. It was still doubtful that the airplane could take off vertically and fly forward at 500 m.p.h. Thus there was talk of powering the XF5U-1 with modern turbine engines. It was thought that it would then have been able to fly easily on one engine and have been capable of demonstrating its inherent capability to hover and otherwise perform as a V/STOL aircraft.

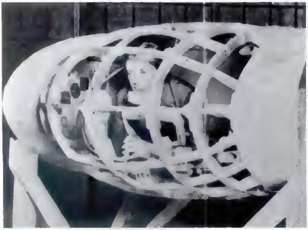
Boone Guyton receives final instructions from designer Charles Zimmerman prior to the V-173's first flight on 23 November 1942. Note the early style national insignia. (Guyton via Lawson)



The partially covered framework of the V-173 and the mock-up of the original prone cockpit proposal.



The V-173 mounted in the NACA full-scale wind tunnel at Langley Field in December 1941. The original two-blade props were used.



The V-173 in 1942 with three blade props and no wheel spats. The bars had been added to the national insignia by this time. Identical view of the V-173 outside a Vought hanger with the wheel spats added. (via Skip Ruff)

Because of its light weight, low power notwithstanding, the V-173 could lift off the runway in calm air after a 200 foot run. In a 25 knot wind, it could be airborne in a zero run. It cruised during tests at about 75 m.p.h., and had a top speed of 138 m.p.h. Because it was an experimental aircraft, it carried only 20 gallons of fuel for short test flights.

"The V-173 was carefully designed with a unique wooden structure which was expensive to build but light, efficient and trouble free. The gearing, shafting and propellers indeed were highly experimental, and we were not in a position to develop them as thoroughly as would have been desirable prior to flight", Zimmerman said.

The V-173 was test flown for the first time from Stratford, Connecticut, on 23 November 1942 by Boone T. Guyton,a former Navy fighter pilot and Vought's chief test pilot. During its test life the V-173 was flown for a total of 131 hours by Guyton, Richard Burroughs, Charles A. Lindbergh and a number of Navy pilots.

The V-173 had gone through weeks of engine runs and ground taxi tests. Guyton had conferred endlessly with Zimmerman after he had taken the airplane five feet into the air on a taxi run. "I guess we're ready to fly, Charlie," he told Zimmerman.

"The initial flight of the plane was one of the most interesting I had made in my career as a professional pilot", Guyton said later. "Strapping on the football helmet I used as a crash helmet, I checked out the engines and controls. As I taxied out from the line Zimmerman waved, shook both hands and walked toward the crash truck from which he was to watch the flight.

"As I pulled into the wind, I noticed the police guard searching for cameras among cars parked along the road by the runway. Kids hanging on the fence were ushered back. Halfway down the take-off run, the same bump in the runway I had hit hundreds of times before annoyed me. The crash truck, overhung on either side with eager observers, paced my run.

"As soon as we were airborne and away from the ground effect, which was large on this type airplane," Guyton said, "I was quickly distressed by the extreme heaviness and sluggishness of the controls. It was apparent that there was a question as to whether I could obtain enough control to bank the airplane sufficiently to complete a turn back to the runway. I was already considering the probable

Two views of the V-173 from below during test hops. The all-flying horizontal stabilizers or tails are angled slightly down to keep the underpowered aircraft somewhat level. From these photos its easy to see why the local constituency would call in flying saucer sightings during test flights over the neighboring countryside. Its also easy to see why the aircraft was named the "Flying Pancake". (Howard Levy)

Side view of V-173 02978 at Vought's Stratford plant. Prop blades are in their angled-back position. Two antennae wires run from the vertical stabilizer tips to the centerpoint of the canopy. (Howard Levy via Swisher) V-173 taxiing out for a test hop. Horizontal stabilizers are cocked full forward. (Howard Levy via W. T. Larkins)

effects of a water landing straight ahead in Long Island Sound."

Although thoughts of a crash crossed Guyton's mind, he also thought about the ten years Zimmerman had worked to get the NACA, Chance Vought and the Navy to accept his concept of a high speed, short take-off and landing airplane. "My thoughts were subconsciously on Charlie back on the runway," he said. "The man whose anxious moment was now the culmination of his years of maximum effort on this single project."

Guyton had the 3,050 pound airplane's stick gripped tightly in both hands. It took a lot of muscle to move it, but the response was positive. He flew it up to 300 feet. The Sound was below and the nose still pointed skyward. Banking slightly, he started a slow sweeping turn, noticing that the rudders were effective and the engines were running at nearly full power.

"Slowly the airplane moved back toward the airport. I felt elated and had a foolish impulse to yell, 'Charlie, she flies!'" He brought the Pancake down to the end of the runway. The landing proved to be "not at all normal." Guyton applied power to effect the flare and decrease the vertical descent, as a helicopter pilot might do. Still using all his muscle on the stick, he eased the nose still higher with three-quarter's power.

"I managed to get the stick full aft and the airplane settled so quickly on the ground from its last few feet of descent that it was both startling and pleasing. The V-173 rolled about 50 feet, it seemed. Landing speed was about 50 m.p.h. I immediately noted to myself that this airplane, designed to be a vertical take-off and landing airplane, showed every promise of filling its design concept mission."

Guyton climbed down through the entry hatch in the floor of the discus-shaped aircraft, to be congratulated by Zimmerman and the ground crew upon sucessfully completing the 13 minute first flight.

The heavy control forces which required Guyton to use both hands on the stick were soon reduced. By varying propeller blade angles and improving the power characteristics of the engines slightly, performance was improved. Trim tabs on the "flying tail", were added and proved helpful.

After about 40 or 50 flights the stabilizing flap, as Vought called it, was added to the trailing wing edge. As Guyton recalls, "I had problems getting the tail down effectively during a low or no power landing. I called it ground effect. The trailing edge flap was to provide automatic relief by deflecting up under the ground effect load when perhaps ten feet above the landing surface. It proved effective, but as I recall, not startling. The airplane always had a tendency to pitch nose down as the flare for landing was made, and more so when power was reduced.

Guyton reported that the cockpit comfort left much to be desired. Lack of power boost on the controls made stick movement difficult, visibility was poor, and he developed backaches from having to lean forward to see where he was going. The cockpit was almost flush with the wing's leading edge. Plexiglass openings in the floor, to let him see the ground on take-off and landing, were useless ---- Guyton reported he was too busy to use them.

During the first and subsequent test flights, of which Guyton made 54, vibration in the cockpit was a persistent problem. This was caused by resonant frequency between the propellers and the nacelle structure, which Zimmerman greatly alleviated by installing vibration dampers on the propellers. The problem was not met in the heavily constructed XF5U-1, but it led to development of articulated propeller blades in the fighter to avoid the non-symmetrical airflow at high angles of attack. Brakes in the V-173 were marginal for taxiing and braking purposes, although safe but cumbersome for ground maneuvering.

Guyton summed up his feelings about the airplane after the first few flights: "To a pilot, being able to apply full power, raise the nose as high as it could be held, have control of the plane about all axes without stalling, was a fascinating event." With full aft stick, full up elevator, full power on both engines, and the airplane in a flight attitude of 45 degrees, he was able to maintain lateral and longitudinal control at all times.

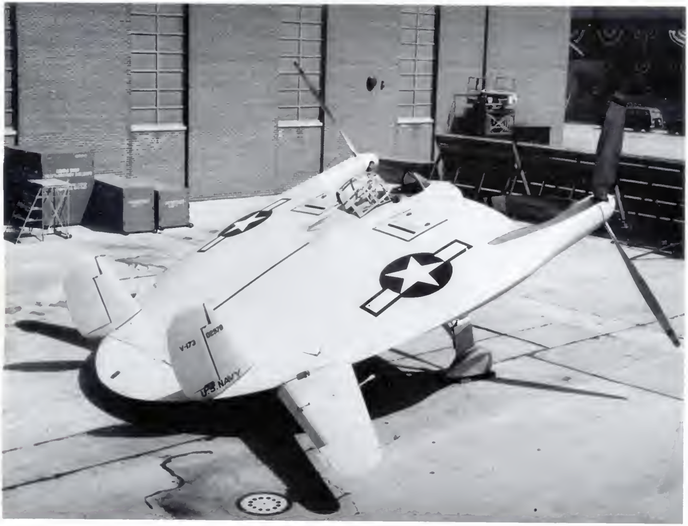
"Throughout the entire flight test program we never were able to make the airplane stall completely or even approach a spinning condition. A notable flight characteristic was the rapid decrease in speed as the airplane was pulled into a tight turn. I found this deceleration to be almost a fascination that would make the plane a formidable opponent in a dogfight.

"On the initial flight, because of the engines' low power, the airplane could not be flown at sufficient speed to gain a level-flight attitude. This, coupled with the high stick forces, made me apprehensive about being able to turn and land at the field. The Zimmer Skimmer, as the plane affectionately was called, was interesting and fun --- but not comfortable --- to fly.

"The nose-high attitude, at all low speed flight ranges except in maneuvers and dives, gave mushy, high stick forces and slow response to the controls. With restricted vision from the cockpit sideways and down or aft and down, I always felt like I had a reasonable workout after flying. The aircraft also had a nose-down tendency during landing.

"It was a truly different airplane to fly. It felt normal even on the first landing after that hairy, long slow turn. You actually applied power in flaring for a landing. Being a former naval carrier pilot, I was keen for the idea of


U.S. NAVY


V-173
U.S. NAVY

Two views of the V-173 from behind. Top photo does not have "V-173" on the rudder. The stabilizing flaps can be seen between the vertical fins. (Howard Levy via Ruff and Larkins)

V-173 being pulled out for the open house at Norfolk on 6 June 1957. (PH1 Morrison via Bob Lawson) Engine run-up on the V-173; note ladder. (Howard Levy via Larkins)

V-173 taxiing from behind with full down horizontal stabilizers. (via Skip Ruff)

3 June 1943 saw Richard Burroughs make an emergency landing on Lordship Beach where the aircraft flipped over on its back in the soft sand. Engine run-up at Floyd Bennet Field, notice open entry hatch. (via Art Schoni)

vertically landing a 500 m.p.h. fighter to a hook installation on a cruiser or battleship."

After Guyton made the first thirteen flights, he was seriously injured in an F4U Corsair crash, and Richard Burroughs took over flying the V-173 for a time. Charles A. Lindbergh made flight number 34, and several Navy pilots made flights, including CDR Ramsey, CDR Booth and LT Najeeb E. Halaby, later head of the FAA in the US. Other company pilots who flew it were William B. Boothby, C. L. Sharp and W. H. B. Millar.

During its flying career, the Pancake was involved in several mishaps which were not too serious because of its light weight and slow speed. On one occasion it landed on Mill River golf course at Stratford. Being a secret project, the plane was placed under guard and towed back to the factory at night.

An engine vapor lock forced it to make an emergency landing on 3 June 1943, on Lordship Beach on Long Island Sound. Pilot Burroughs flipped it over on its back in soft sand trying to avoid running over a sunbather, whose towel was found underneath the upturned Pancake when it was righted.

The aircraft broke two propeller blades in the mishap. Lindbergh and Zimmerman were watching when it disappeared from sight and rushed to the beach. Up to then Lindbergh had declined to fly the aircraft. "He was worried that if the aircraft turned over on its back the cockpit would be crushed and he would be trapped," Zimmerman recalled. "The aircraft did overturn, the canopy was not crushed. Burroughs exited through it after shoving some sand aside." Lindy then remarked to Zimmerman, "Now I'm ready to fly it." The airplane was towed back to the nearby plant and repaired.

A third near-serious event came during the thirtieth anniversary airshow of Chance Vought Aircraft in 1947. With Guyton at the controls, the plane had difficulty getting up flying speed and lift in the hot air. It nearly

ran into high tension wires and a cliff near the end of the runway.

After the airshow the V-173 flew back to the Vought factory in Stratford, Connecticut. It was to be the swan song for the spectacular-looking airplane that had paved the way for the XF5U-1 Navy fighter. The full-scale but lightly-built V-173 was put in storage at the Norfolk, Virginia, Naval Air Station. Today, its vertical fins and "flying tail" removed, it is in storage at the Smithsonian Institution's Air Museum warehouse in Silver Hill, Maryland.

Shortly thereafter the XF5U-1 contract was suddenly cancelled on 17 March 1947, after it had made a number of successful taxiing trials but before it had a chance to fly. The day of the jet engine had arrived and the XF5U-1's chance to prove itself was ended and the XF5U-1 was ordered to be demolished.

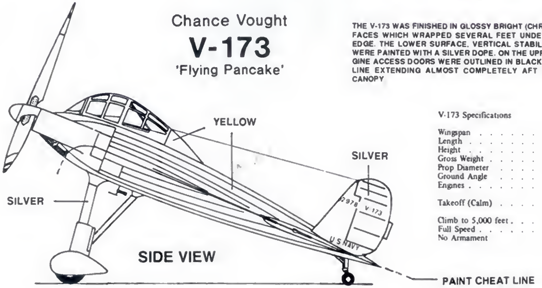
In September 1941 the Navy asked Vought to build two military versions of the V-173 designated VS-315, which later became the XF5U-1. One would be a flight test aircraft and the other was to be used for static testing in the laboratories.

Charles Zimmerman with Boone Guyton on the state-of-the-art wood ladder which was used to enter the V-173's cockpit. The V-173 on display at the 1957 Norfolk open house. (via Skip Ruff)

V-173 cockpit photos. (via Eagles Talon)

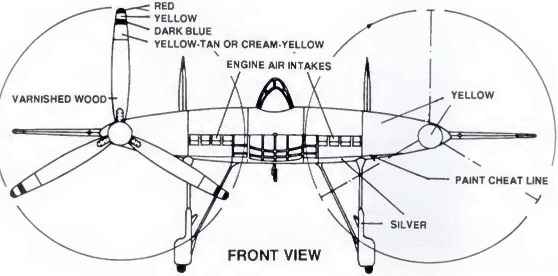
Chance Vought
V-173
'Flying Pancake'

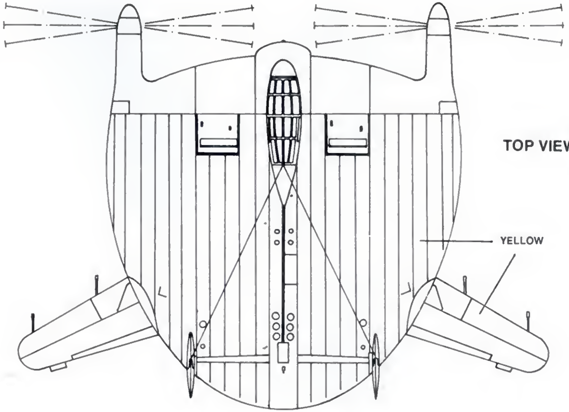
THE V-173 WAS FINISHED IN GLOSSY BRIGHT (CHROME) YELLOW UPPER SURFACES WHICH WRAPPED SEVERAL FEET UNDER THE FORWARD LEADING EDGE. THE LOWER SURFACE, VERTICAL STABILIZERS AND LANDING GEAR WERE PAINTED WITH A SILVER DOPE. ON THE UPPER SURFACE THE TWO ENGINE ACCESS DOORS WERE OUTLINED IN BLACK AND THERE WAS A BLACK LINE EXTENDING ALMOST COMPLETELY AFT FROM THE BACK OF THE CANOPY



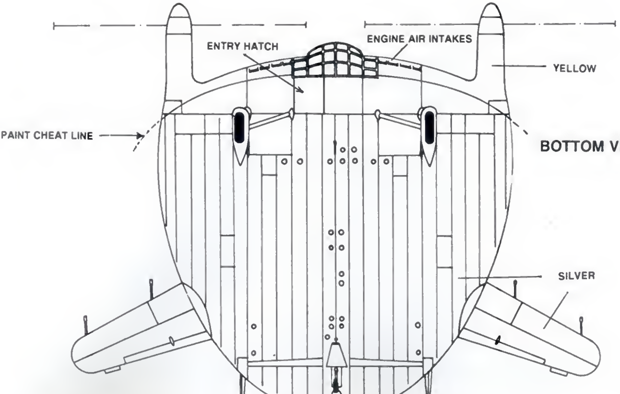
V-173 Specifications

Wingspan	23 FT 4 IN.
Length	26 FT 8 IN.
Height	12 FT 11 IN.
Gross Weight	2,258 LB
Prop Diameter	16 FT 6 IN.
Ground Angle	22 DEG 15 MIN
Engines	2 Continental A-80 80 hp each
Takeoff (Calm)	200 FT 25-knot wind in 0 feet
Climb to 5,000 feet	7 MIN
Full Speed	Sea Level 138 MPH
No Armament	

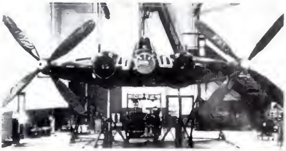




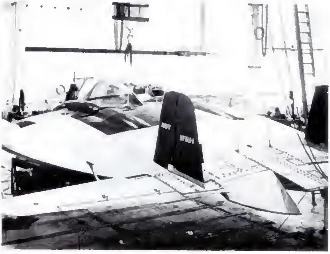
TOP VIEW



BOTTOM VIEW



The XF5U-1 mock-up rests on wooden sawhorses at the Vought plant on 8 June 1943. Mock-up was painted Navy blue and white and was fitted with three bladed propellers. The three small circular openings in the wing root between the fuselage and the engine were for the proposed 50 cal. machine guns. Later proposals gave the option of four 20 mm. cannon instead of the six 50 cal. guns. A revised mock-up was inspected in August. At left, the finished XF5U-1 is being weighed and aligned prior to engine runs and ground testing. Hydromatic props were fitted to the XF5U-1 initially. Below, static test article being set up for vibration testing.



A wooden mock-up of the fighter was completed on 7 June 1943. By November it was decided that the interim propellers on the XF5U-1 would not do, and that propellers with articulated or "flapping blades" would be required.

Flight tests in the V-173 were progressing satisfactorily and the contract for the program was consolidated with the XF5U-1. Such a contract was issued on 15 July 1944. Because of the nature of the Pancake development program, Vought requested the Navy for permission to transport the XF5U-1 flight test vehicle to Muroc Dry Lake in California, where unlimited emergency landing space and few observers would make testing easier.This move was never made. Plans had called for the aircraft to go to Muroc via the Panama Canal that December for its first flight.

Gear box problems in the big right-angle drive shafts to each propeller had negated the chance to fly the XF5U-1 safely from any airfield other than Muroc. The quarter-million dollar price tag on the test program also was a factor, and the Navy preferred to spend the money on jet aircraft. The complicated shafting and gear boxes presented problems that might have hampered the project anyway as other turboprop projects of that era also were having gear box trouble.

The original propellers installed on the XF5U-1 fighter were conventional Hamilton Standard Hydromatics, similar to those on the F4U-4 Corsair. It was unlikely that these props were used for any other purpose than for appearance or for engine and gear shaft testing. It has been speculated that the F4U-4 props were used for taxi tests, but that capability is questionable since the XF5U-1 drive system was intended to operate counter-rotating propellers and the F4U-4 props were of the same hand, although the left hand blades appear to be reversed with the Hamilton Standard insignia being on the back side. This would have allowed some shakedown of the aircraft systems with the engines running at low power.

When it was discovered that flapping blades would be required to avoid vibration by unsymmetrical airflow and to resist heavy loads when flying at high angles of attack, Zimmerman had a problem. "For a time it appeared the project would have to be abandoned," Zimmerman said, "but after a desperate weekend of work I came up with a design using two pairs of teetering blades, similar to the Bell helicopter rotor, one pair mounted ahead of the other to form a four-bladed propeller."

Wind tunnel model of the XF5U-1.

The XF5U-1 was powered by a pair of Pratt & Whitney R-2000-7 engines developing 1,350 h.p. each. The predicted speed range of the big fighter was amazing. Whereas other

XF5U-1 33958 sits on the ramp during engine tests. F4U-4 style props were installed initially.

designers could not better a one-to-four ratio in landing speed to top speed, the Vought machine was expected to achieve a range from 40 to 425 m.p.h. with the original engines, 20 to 460 with water injection and 0 to 550 with gas turbine powerplants. Carrying 261 gallons of internal fuel, compared to only 20 gallons in the prototype V-173 the XF5U-1 had an expected range of 1,000 miles. Compared to the V-173's take off in 200

3/4 rear view of the XF5U-1 fitted with the Hamilton Standard props prior to the first ground run. 3/4 rear view on 8-21-47 with the new flapping props fitted. Dull black areas were taped on walking and work areas used to protect the metalite surface.

feet in calm air, the XF5U-1, which weighed 14,550 pounds (empty), would have required 721 feet to take off with the original engines. The XF5U-1 also had a slightly lower ground angle of 18 degrees which was nearly 5 degrees less than the V-173.

Armament for the XF5U-1 was to be six .50 cal machine guns or four 20mm cannons and two 1,000 pound bombs or drop tanks. The guns were to be stacked vertically between the

3/4 front view and side view of the XF5U-1 with the articulating prop blades. The bulge on the gear door was only on the outside doors.

engines and the cockpit. The guns were never installed in the XF5U-1.

When the end came the Navy ordered the flight test fighter to be destroyed. The static test example had already been broken up during laboratory strength tests, as had been intended. The sad task of destroying the aircraft fell to Lee C. Stetson, acting chief of the experimental department, which had built the two machines.

Both R-2000 engines were removed, along with instruments and other salvageable items, and the aircraft was then placed under a crane, from which hung a huge steel ball. The first few drops failed to dent the strong framework, so measurements were made and the ball dropped between main beams and spars. The wrecking ball went through the metal-and-balsa sandwich skin, called Metalite, and hit the pavement below. After a few more drops the shiny new aeroplane was a pile of twisted aluminium. Blowtorch wielding employees completed the destruction by cutting the framework into small pieces. These scraps, together with jigs and materials from other projects were piled together for bidding by the local scrap dealers.

During this procedure the Navy requested Vought to return some $6,000 worth of pure silver used in making bearing plates in the propeller gear boxes. Both guards and engineers attempted to find the silver in the snow covered pile of metal, but in the end the company paid the Navy for the silver and sold the scrap to a dealer. When the dealer found the silver he tried to sell it to a downtown jeweler who called the police and the F.B.I. At which point, Vought officials had to vouch for the scrap dealer's right to have the silver.

With the completion of the Flying Pancake program, the Navy approved the transfer of the V-173 to the Smithsonian. Although a light aircraft, the V-173's width of more than 30 feet almost filled a city street. A tractor towed it through Stratford and Bridgeport during the daytime and put it aboard a tugboat for transport to Norfolk. It took the tugboat two days and nights to make the short voyage in a snowstorm. Transfer to the Smithsonian storage yard came at a later date.

So the fifteen year dreams of inventor Charles H. Zimmerman with the financial and engineering support of Chance Vought Aircraft went out the door on the eve of apparent success. Later projects like the XC-142A and XV-15 would be destined to pick up the testing legacy of the Flying Pancakes.

A 1990s VIEW OF THE F5U

Tommy Thomason, an exective with Bell Helicopter Textron, had this to say about the program: " It is probably just as well that the F5U program was terminated when it was. The concept will live on as an unfulfilled dream rather than as the disappointment it would have probably become. The performance projections were undoubtedly optimistic and the actual and prospective shortcomings of the concept and design were being overlooked or minimized.

"By necessity, the design embodied transmissions, gearboxes, and shafting. These are inherently troublesome in development and a burden operationally. The layout required that the drive train turn 90 degrees twice between the engine and the propeller and each 90 degree turn reduces efficiency and reliability and increases weight and maintenance requirements. These shotcomings are accepted in a helicopter because they permit true hovering flight but the F5U was not able to hover so they would have been less acceptable.

"It should be noted that there was only one prototype and there was a distinct possibility of a gearbox failure if extensive bench testing had not been accomplished under flight loading. Since this is a difficult environment to duplicate even if the flight loads had been accurately predicted, which is doubtful, it is probable that the gearboxes were underdeveloped and an inflight failure was not unlikely. Most failures would have resulted in the loss of the only prototype and a possibly tragic end to the test program.

"To achieve maximum propulsive efficiency at both low and high speeds and use the full horsepower available, the transmissions would have to have had two speed gearing. This results from the fact that the propeller should turn faster in very low speed flight than in high speed flight while the maximum torque capability of a piston engine occurs over a relatively small range of RPM. A two speed transmission would further increase the drive system complexity and the pilot workload.

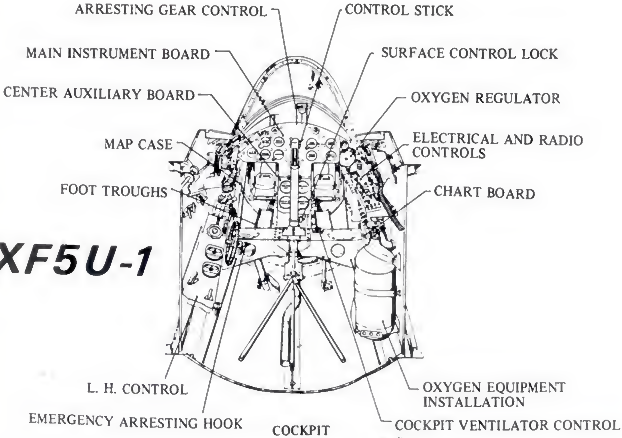
"The low aspect ratio of the F5U penalizes long range cruise performance. Vought claimed that the propeller slipstream minimized the impact but this would not be the first time that a manufacturer was overly optimistic about an unusual and basically unproven aerodynamic feature based on small scale or even full scale wind tunnel tests. The V-173 was too underpowered to verify cruise performance predictions even if its landing gear had been retractable.

"The low aspect ratio also produced another characteristic that may not have been viewed as entirely beneficial, that of rapid drag rise during a pull up or level flight turn. This characteristic is shared by delta wing fighters and provides the ability to make one, but only one, really big move. It has some value as a defensive tactic but the time required to reaccelerate limits the capability to reengage .

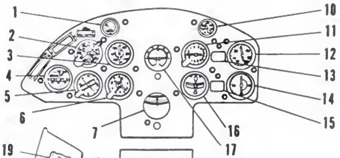
"The size of the propellers severely limited the aircraft's ability to employ conventionally launched rockets or missiles.

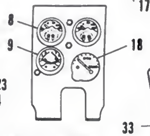
"Finally, the stability and control in high speed flight of an aircraft with very large flapping propellers was not well understood in the late forties and it is very doubtful that Vought got it right by happenstance. The vibration and loads due to flapping would have also required extensive development work and may not have been resolvable."

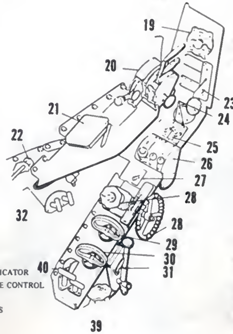
XF5U-1

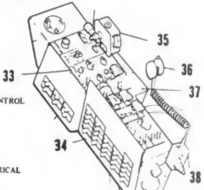


COCKPIT



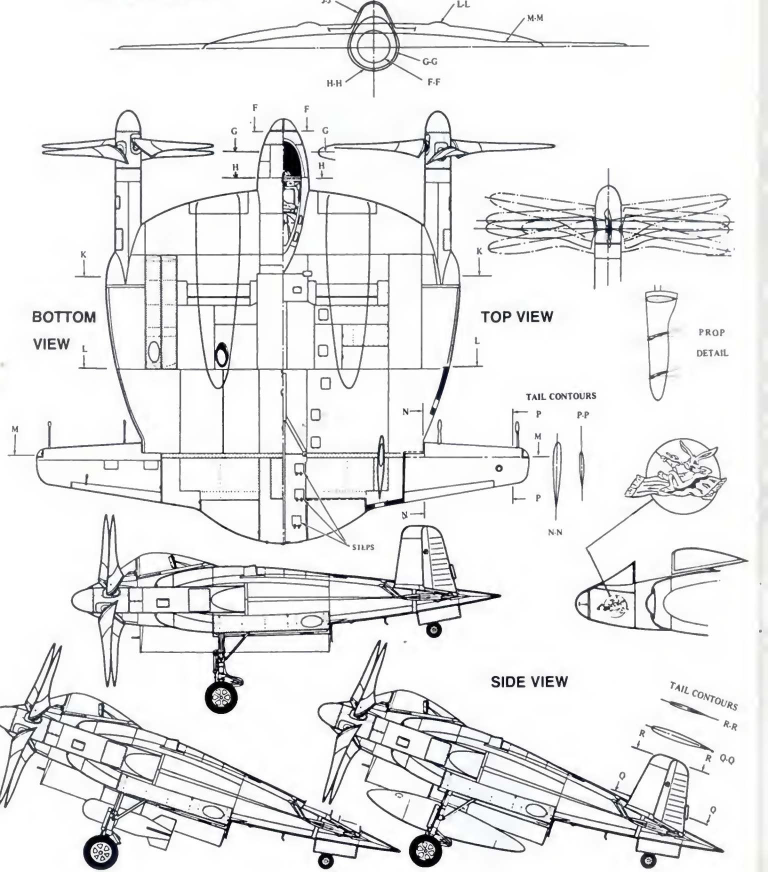




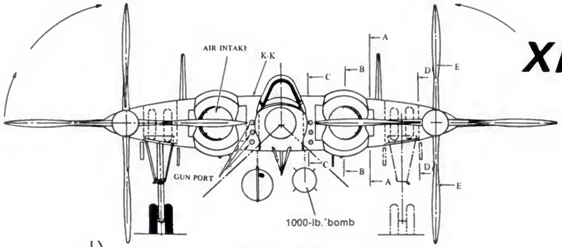


1 VOLTMETER
2 ELAPSED - TIME CLOCK
3 AIRSPEED INDICATOR
4 LANDING GEAR TAIL WHEEL POSITION INDICATOR
5 COMPASS INDICATOR
6 ALTIMETER
7 DIRECTIONAL GYRO INDICATOR
8 ENGINE GAGE UNIT
9 ENGINE CYLINDER TEMPERATURE INDICATOR
10 FUEL QUANTITY INDICATOR
11 CLIMB INDICATOR
12 MANIFOLD PRESSURE GAGE
13 FUEL RESERVE LIGHT
14 TACHOMETER INDICATOR
15 WATER RESERVE LIGHT
16 TURN AND BANK INDICATOR
17 HORIZON INDICATOR
18 HYDRAULIC PRESSURE GAGE
19 IGNITION SWITCH
20 THROTTLE AND PROPELLER CONTROL
21 ARM REST
22 EMERGENCY FUEL TANK, PRESSURE RELEASE
23 LANDING GEAR CONTROL
24 ENGINE COOLING FLAPS SWITCH AND INDICATOR
25 OIL COOLER SWITCH AND INDICATOR
26 SUPERCHARGER AND MIXTURE CONTROL
27 FUEL PUMP SWITCH
28 AILERON TRIM TAB CONTROLS
29 FUEL TANK|SELECTOR
30 ENGINE SELECTOR
31 SHOULDER HARNESS CONTROL
32 FIRE EXTINGUISHER CONTROL
33 RADIO CONSOLE CONTROL PANEL
34 ELECTRICAL SYSTEM CIRCUIT BREAKER
35 COCKPIT CANOPY ELECTRICAL CONTROL
36 HAND MICROPHONE
37 ELECTRICAL CONTROL
38 PILOT'S JACK BOX
39 EMERGENCY LANDING GEAR CONTROL
40 TAIL WHEEL LOCK

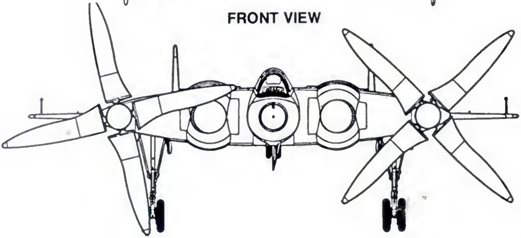
CHANCE-VOUGHT XF5U-1 "FLYING PANCAKE"

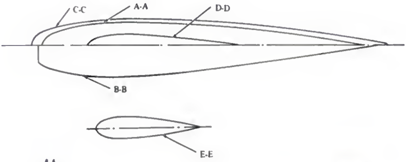


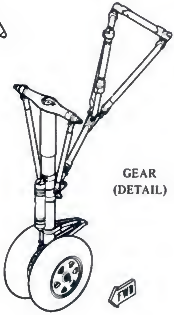
XF5U-1



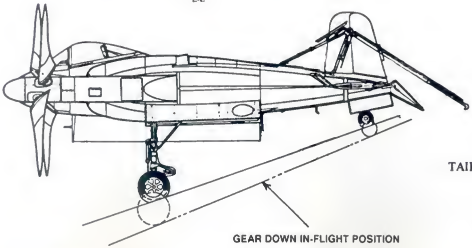
FRONT VIEW



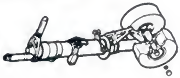




GEAR
(DETAIL)

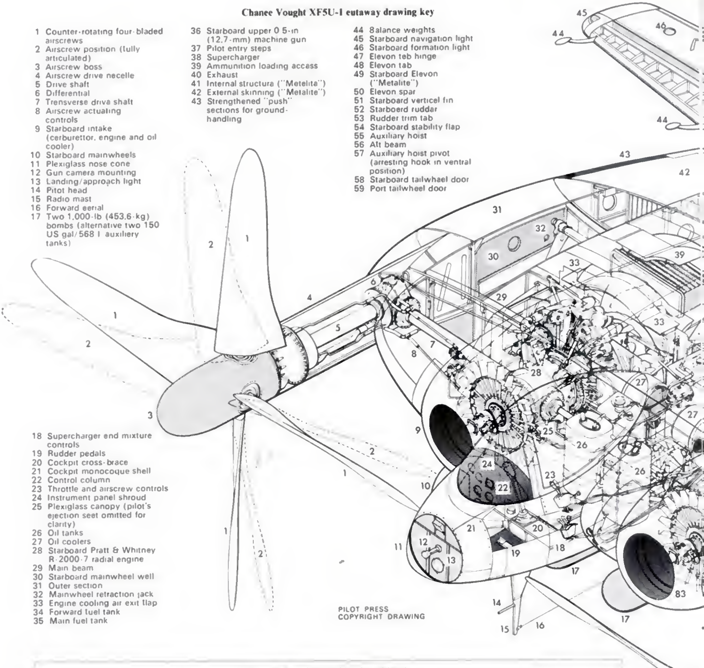


TAILGEAR (DETAIL)



Chance Vought XF5U-1 cutaway drawing key

1 Counter-rotating four-bladed airscrews
2 Airscrew position (fully articulated)
3 Airscrew boss
4 Airscrew drive necelle
5 Drive shaft
6 Differential
7 Trensverse driva shalt
8 Airscrew actuating controls
9 Starboard intake (carburettor, engine and oil cooler)
10 Starboard mainwheels
11 Plexiglass nose cone
12 Gun camera mounting
13 Landing/approach light
14 Pitot head
15 Radio mast
16 Forward eerial
17 Two 1,000-lb (453.6-kg) bombs (alternative two 150 US gal/568 l auxiliery tanks)
18 Supercharger end mixture controls
19 Rudder pedals
20 Cockpit cross-brace
21 Cockpit monocoque shell
22 Control column
23 Throttle and airscrew controls
24 Instrument panel shroud
25 Plexiglass canopy (pilot's ejection seet omitted for clarity)
26 Oil tanks
27 Oil coolers
28 Starboard Pratt & Whitney R-2000-7 radial engine
29 Main beam
30 Starboard mainwheel well
31 Outer section
32 Mainwheel retraction jack
33 Engine cooling air exit flap
34 Forward fuel tank
35 Main fuel tank
36 Starboard upper 0.5-in (12.7-mm) machine gun
37 Pilot entry steps
38 Supercharger
39 Ammunition loading access
40 Exhaust
41 Internal structura ("Metelita")
42 External skinning ("Metalite")
43 Strengthened "push" sections for ground-handling
44 Balance weights
45 Starboard navigation light
46 Starboard formation light
47 Elevon teb hinge
48 Elevon tab
49 Starboard Elevon ("Metalite")
50 Elevon spar
51 Starboard verticel fin
52 Starboerd ruddar
53 Rudder trim tab
54 Starboard stability flap
55 Auxiliary hoist
56 Aft beam
57 Auxiliary hoist pivot (arresting hook in ventral position)
58 Starboard tailwheel door
59 Port tailwheel door



Chance Vought XF5U-1 Specification

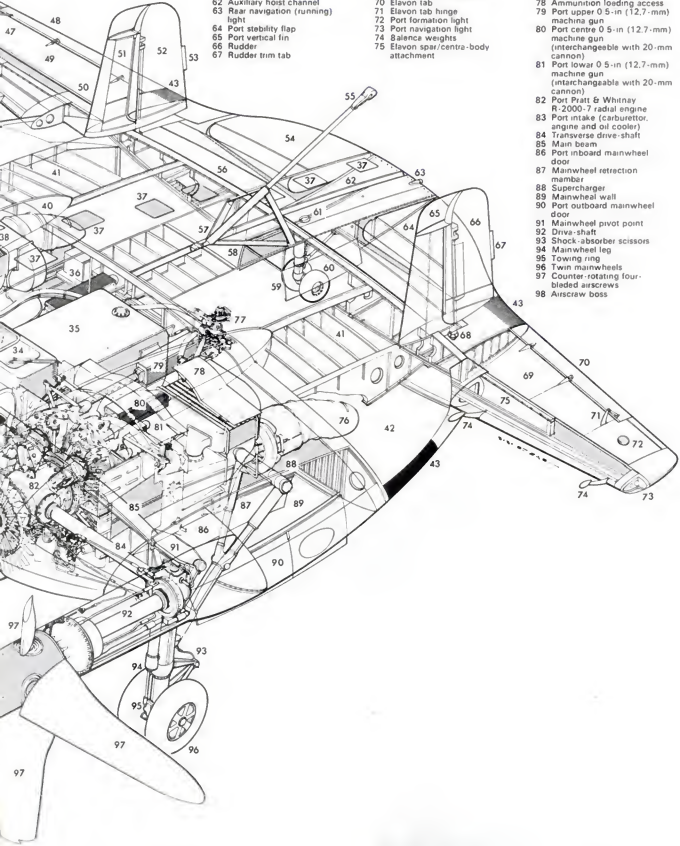
Power Plant: (Proposed) Two Pratt & Whitney R-2000-2(D) Twin Wasp turbo-supercharged 14-cylinder two-row radial air-cooled engines each rated at 1,600 hp for take-off and war emergency and driving 16-ft (4.88-m) four-bladed articulated airscrews. Internal fuel capacity, 280 US gal (1 060 l) and provision for two 150 US gal (568 l) drop tanks.

Armament: (Proposed) Six 0·5-in (12.7-mm) Browning MG 53-2 machine guns with 400 rpg and provision for two 1,000-lb (453.6-kg) bombs on ventral racks.

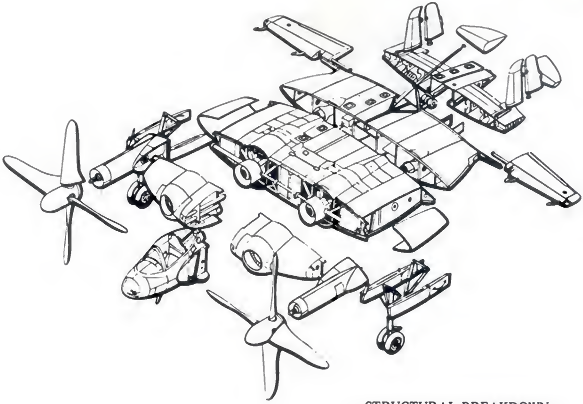
Performance: (Estimated at 16,802 lb 7 620 kg) Max speed at military rated power, 363 mph (584 km/h) at sea level, 401 mph (645 km/h) at 10,000 ft (3 048 m), 418 mph (673 km/h) at 15,000 ft (4 572 m), 435 mph (700 km/h) at 20,000 ft (6 096 m), 456 mph (734 km/h) at 25,000 ft (7 620 m), 482 mph (775 km/h) at 30,700 ft (9 357 m), at war emergency power, 394 mph (634 km/h) at sea level, 431 mph (694 km/h) at 10,000 ft (3 048 m), 451 mph (726 km/h) at 15,000 ft (4 572 m), 472 mph (759 km/h) at 20,000 ft (6 096 m), 492 mph (792 km/h) at 25,000 ft (7 620 m), 504 mph (811 km/h) at 28,900 ft (8 808 m); initial climb rate at normal rated power, 2,200 ft/min (11.18 m/sec), at military rated power, 3,070 ft/min (15.60 m/sec), at war emergency power, 3,950 ft/min (20.06 m/sec); time (normal rated power) to 10,000 ft (3 048 m), 4·9 min, to 20,000 ft (6 096 m), 11·1 min; service ceiling, 32,000 ft (9 754 m); endurance at 1,000 ft (305 m), 1·04 hr at max speed, 1·81 hr at 90% max speed, 3·44 hr at 75% max speed, 4·26 hr at 60%, max speed; max range at 1,000 ft (305 m), 910 mls (1 465 km) at average speed of 236 mph (380 km/h); take-off distance (calm), 930 ft (283 m), into 15-knot (28 km/hr) wind, 680 ft (207 m), into 25-knot (46 km/hr) wind, 520 ft (158 m); stalling speed (full load without power), 105 mph (169 km/h), (full load with military rated power), 46 mph (74 km/h).

Weights: Normal loaded, 16,802 lb (7 620 kg); max overload, 18,917 lb (8 581 kg); landing weight, 15,542 lb (7 050 kg).

Dimensions: Overall width (across tailplane), 32 ft 6 in (9.90 m); overall width across airscrews (diagonal), 31 ft 9 in (9.68 m), (square), 36 ft 5 in (11.10 m); length, 28 ft 7½ in (8.72 m); height, 14 ft 9 in (4.50 m).

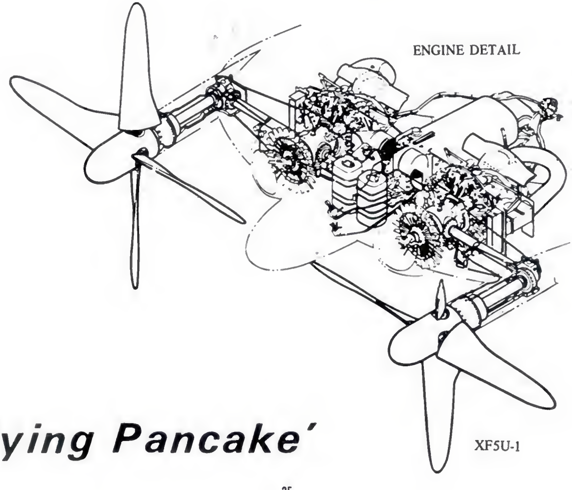


60 Twin tailwhaals
61 Saction light
62 Auxiliary hoist channel
63 Raar navigation (running) light
64 Port stebility flap
65 Port vertical fin
66 Rudder
67 Rudder trim tab
68 Ruddar post
69 Port elevon ("Metalite")
70 Elavon tab
71 Elavon tab hinge
72 Port formation light
73 Port navigation light
74 8alenca weights
75 Elavon spar/centra-body attachment
76 Exhaust
77 Fuel pump
78 Ammunition loeding access
79 Port upper 0 5-in (12,7-mm) machina gun
80 Port centre 0 5-in (12.7-mm) machine gun (interchangeeble with 20-mm cannon)
81 Port lowar 0 5-in (12,7-mm) machine gun (intarchangaabla with 20-mm cannon)
82 Port Pratt & Whitnay R-2000-7 radial engine
83 Port intake (carburettor, engine and oil cooler)
84 Transverse drive-shaft
85 Main beam
86 Port inboard mainwheel door
87 Mainwheel retrection mambar
88 Supercharger
89 Mainwheal wall
90 Port outboard mainwheel door
91 Mainwheel pivot point
92 Driva-shaft
93 Shock-absorber scissors
94 Mainwheel leg
95 Towing ring
96 Twin mainwheels
97 Counter-rotating four-bleded airscrews
98 Airscraw boss



STRUCTURAL BREAKDOWN

ENGINE DETAIL



'Flying Pancake'

XF5U-1

AIRCRAFT MODEL	TAKE-OFF & CLIMB CHART	ENGINE MODEL
XF5U-1		(2) R-2000- 7

TAKE-OFF DISTANCE (FEET)

GROSS WEIGHT, LBS.	HEAD WIND M.P.H.	HEAD WIND KTS.	GROUND RUN AT SEA LEVEL
14,550	0	0	710
	17	15	490
	35	30	300
	52	45	160

NOTE INCREASE CHART DISTANCES AS FOLLOWS 80°F + 10%
DATA AS OF JUNE 15, 1946

TAKE-OFF DISTANCE FOR HARD SURFACE RUNWAY.
TAKE OFF PROPELLER G.R. .403
TAKE-OFF GROUND RUN IN 3 POINT ATTITUDE

OPTIMUM TAKE-OFF WITH 2700 R.P.M., 49 IN. HG IS 80% OF CHART VALUES

CLIMB DATA

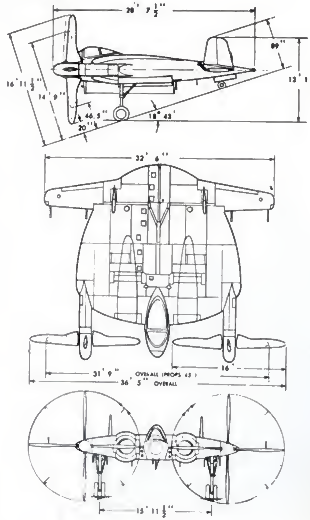
GROSS WEIGHT LBS	AT SEA LEVEL BEST E.A.S. M.P.H.	KTS	RATE OF CLIMB F.P.M.	GALS. OF FUEL USED	AT 5,000 FEET BEST E.A.S. M.P.H.	KTS.	RATE OF CLIMB F.P.M.	FROM SEA LEVEL TIME MIN.	FUEL USED	AT 10,000 FEET BEST E.A.S. M.P.H.	KTS.	RATE OF CLIMB F.P.M.	FROM SEA LEVEL TIME MIN.	FUEL USED	AT 15,000 FEET BEST E.A.S. M.P.H.	KTS	RATE OF CLIMB F.P.M.	FROM SEA LEVEL TIME MIN.	FUEL USED	AT 20,000 FEET BEST E.A.S. M.P.H.	KTS	RATE OF CLIMB F.P.M.	FROM SEA LEVEL TIME MIN	FUEL USED
14,550	175	150	3000	20	175	150	3000	2	30	175	150	2500	4	40	170	145	1900	6	50	165	145	1000	9	60

CLIMB WITH NORMAL POWER PROP G.R. .1743:1.
POWER PLANT SETTINGS (INFORMATION TO BE RELEASED FOLLOWING FLIGHT TESTS)
DATA AS OF JUNE 15, 1946

FUEL USED (U.S. GAL.) INCLUDES WARM UP AND TAKE OFF ALLOWANCE
FUEL AVAILABLE BEFORE WARM UP 261 GALS

LEGEND

- E.A.S. EQUIVALENT AIRSPEED
- M.P.H. MILES PER HOUR
- KTS KNOTS
- F.P.M. FEET PER MINUTE
- G.R. GEAR RATIO
- S.F.C. STANDARD FUEL CONSUMPTION



THE 18 INCH PERSONAL INSIGNIA FOUND ON BOTH SIDES OF THE FUSELAGE WAS BUGS BUNNY RIDING ON A MAGIC CARPET. BUGS BUNNY WAS GREY WITH A WHITE STOMACH AND FACE DETAILED IN PINK AND BLACK. THE 18 INCH DISK WAS LIGHT BLUE OUTLINED IN RED. THE MAGIC CARPET WAS RED AND ORANGE WITH YELLOW FRINGE. BUGS BUNNY WAS EATING A ORANGE CARROT WITH GREEN LEAVES.

Front view and 3/4 front view of the XF5U-1. The propeller blades were black from the root with white stencilling, then varnished mahoghany with yellow tips. The right-hand blade had Hamilton Standard oval decals and both sides had small white "tracking" diamonds on them. The significance of the plumbing and the two cylinders under the lower fuselage in the bottom photo is not known.

Rear view and 3/4 rear view of the XF5U-1 on 21 August 1947 with taped-on work areas and engine panels removed. The good size "stabilizing flaps" can be seen between the two vertical fins.

BY TOMMY THOMASON

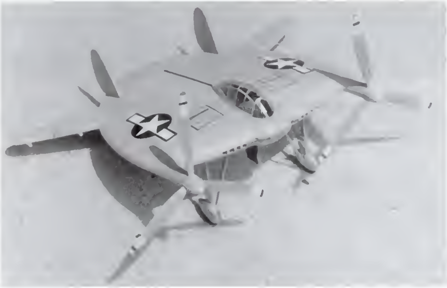
EAGLES TALON 1/72 SCALE VACUFORM VOUGHT V-173

This is a relatively simple vacuform kit which consists of an upper and lower fuselage half, vertical fin halves, outlines on a flat sheet of the landing gear and propeller blades, a pilot seat, and canopy and downward vision window transparencies. The parts are molded on relatively thick plastic but the panel lines and surface finish are not as crisp and clean as in previous offerings from this manufacturer. No decals are provided.

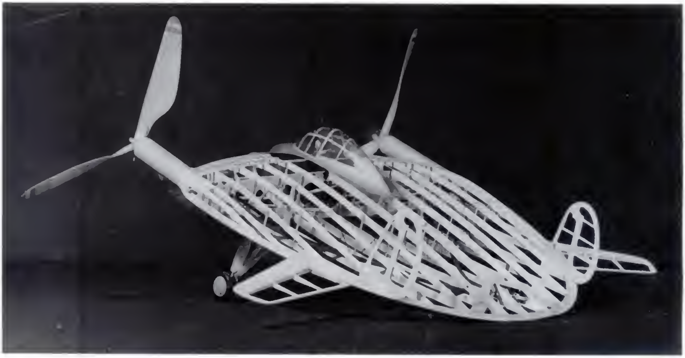
The fit is very good. I did separate the ailevators from the upper and lower halves of the fuselage and built them separately because I thought that this would make the parts preparation and assembly easier.The instruction sheet provides a good multi-view drawing, a few photos including two cockpit photos reproduced on page thirteen of this book. The drawings omit the cockpit access door which has been added to the drawing on page fourteen of this book.

The kit represents the V-173 in its final configuration with wheel spats, a pair of stabilizing flaps on the rear end of the fuselage, and counter-weighted ailevators similar to those on the XF5U. This configuration is the one shown in the drawings, although I have never seen a photo of it with the circle and star insignia as shown on the kits drawing. The original configuration is depicted in a line drawing on the first page of the instruction sheet. It had bare wheels, no stabilizer flaps, and very different ailevators.

From close inspection of photos of the spatted landing gear, you will see that it had hinged doors and fixed fairings which permitted the spat portion to move with the lower end of the oleo strut and be streamlined in flight with respect to the trailing and inboard struts. A pair of hinged doors on the rear of the spat permitted it to stroke up past the trailing strut. The kits side view drawing is not accurate with respect to the position of the spat versus the trailing strut when the aircraft is sitting on the ground. This deficiency is corrected in the drawing on page thirteen of this book.

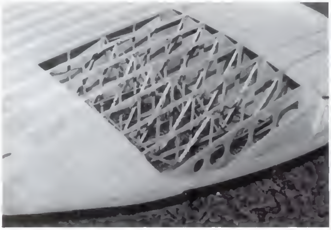


THIRTEEN INCH RUBBER BAND POWERED V-173 BUILT BY DICK JOHNSON



SKIP RUFF'S V-173 RADIO CONTROLLED FLYING MODEL

This radio controlled model has an overall wingspan of 66 inches and weighs 15 pounds. Skip's V-173 won first place in the R/C sport-scale-military category at the 1980 Pasadena modeler's convention.



SKIP RUFF'S XF5U-1 RADIO CONTROLLED FLYING MODEL

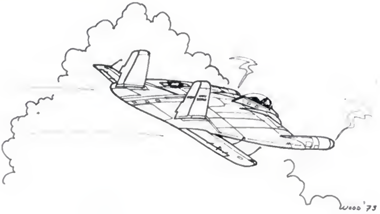
Small proof of concept model with a 40 inch wingspan and a weight of 4 pounds. A single motor in the nose was used.

AIRMODEL / COMBAT MODEL VACUFORM 1/72 SCALE XF5U-1

THE XF5U-1 IN PLASTIC
BY THOMMY THOMASON

This is a simple, crude, incomplete, and not very accurate vacuform kit. Only upper and lower fuselage halves, vertical fin halves, and canopy and nose transparencies are provided in the AirModel kit. The same mold is used for the Combat Models offering with the addition of inaccurate and all but useless propellers and shallow and poorly shaped wheel wells. Only the thinner canopy is superior to the parts in the AirModel kit. I wasn't looking forward to the amount of work required to build this model so I was overjoyed when Pegasus released a limited production injection molded kit of this aircraft.

airmodel 1:72 KIT 138

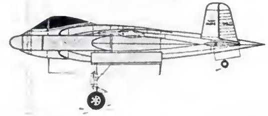


PEGASUS INJECTION MOLDED 1/72 SCALE XF5U-1

This is an injection molded kit from relatively low cost tooling which requires some preliminary work to remove flash and improve the fit. The first impression is a good one, since the overall shape appears to be accurate and the panel lines are finely engraved. A lot of effort is required to produce the completed model. The kit is incomplete and not well engineered which is not unusual for products from the cottage industry. The only cockpit detail included is a seat and instrument panel, neither of which is accurate. White metal landing gear struts are provided but not the associated retraction mechanism and oleo strut scissors although there are location points for them on the main gear strut. Also a mounting arrangement for the landing gear has to be developed by the modeler since there is none. In the kit both landing gear doors have tire bulges in them when only the outboard doors should have them. The engine cooling fan has to be cut down to fit between the fuselage halves. Some of the required decals are included but the Bugs Bunny on a flying carpet insignia is just a white outline which needs to be colored by the modeler.

Kit No. 4002

PEGASUS Vought XF5U-1. Flying Flapjack



1/72

HASEGAWA INJECTION MOLDED 1/72 SCALE XF5U-1

BY THOMMY THOMASON

This is a very unusual choice for a major manufacturer but is a very welcome, if expensive, alternative to the models available. It is a high quality kit in all respects and a much better value than the Pegasus version. The kit unfortunately follows the error on the Vought information sheet for the XF5U-1 which shows an ESCAPAC type ejection seat; which should be replaced by a conventional seat and separate headrest.

The kit instructions would have you paint the landing gear struts silver, when in fact they should be blue except for the oleo struts, which of course were chrome silver. The damper on the front side of the main gear strut appears to be green or grey on early photos and worn to silver in late photos. The instructions also say to paint the bulkhead under the clear plastic nose silver, but the box art shows this to be zinc chromate green which appears to be more accurate.

More decals are provided than actually needed with twice as many XF5U-1 designations, NAVY, and Bureau Numbers decals, as these decals should only appear on the outside of the vertical fin. For some reason, the blades on the right hand prop did not have the red oval Hamilton Standard insignia as provided for the decal sheet.

The fit is good except for around the engine intakes and on the propeller shafts, which require filling and sanding.

AIRCRAFT MODEL
XF5U-1
ENGINES: (2) R-2000-7

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS 15,000 TO 14,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

LIMITS	R.P.M.	M.P. IN. HG	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	G.P.H. 1 ENGINE
MILITARY POWER	2700 2700	49 41	LOW HIGH	A.R. A.R.	5 MIN	260 C	200 165
NORMAL POWER	2550 2550	44 41	LOW HIGH	A.R. A.R.	CONTINUOUS	232 C	155 145

COLUMN I		FUEL	COLUMN II	
RANGE IN AIRMILES		U.S. GAL.	RANGE IN AIRMILES	
STATUTE AT SEA LEVEL	NAUTICAL AT SEA LEVEL		STATUTE	NAUTICAL
305	260	261	740	640
265	230	230	650	565
230	200	200	565	490
195	170	170	480	420
160	140	140	395	345
130	110	110	310	270
95	80	80	225	195
60	50	50	140	125

MAXIMUM CONTINUOUS							PRESS. ALT. FEET	MAXIMUM AIR RANGE						
BLOWER	R.P.M.	M.P. IN. HG.	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.		BLOWER	R.P.M.	M.P. IN. HG.	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. M.P.H.	APPROX. T.A.S. KTS.
H	2550	F.T.	A.R.	232	368	319	20000							
H	2550	F.T.	A.R.	280	388	337	15000							
L	2550	F.T.	A.R.	308	386	335	10000	H	1700	31	A.L.	99	280	243
L	2550	41	A.R.	304	367	318	5000							
L	2550	41	A.R.	299	347	301	S.L.							

DATA AS OF JUNE 15, 1946.

ALL OPERATIONS WITH PROP. G.R. .1763:1.

SPECIAL NOTES

1. MAKE SPECIAL ALLOWANCE FOR WARM-UP, TAKE-OFF, AND CLIMB (SEE T.O. AND CLIMB CHART), PLUS ALLOWANCE FOR WIND RESERVE, AND COMBAT AS DESIRED.
2. ALL FUEL CONSUMPTION VALUES INCLUDE A 15% INCREASE IN ENGINE MANUFACTURER'S S.F.C.

EXAMPLE

AT 14,500 LBS. GROSS WEIGHT WITH 241 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 20 GAL.) TO FLY 265 STATUTE AIRMILES AT 0 FT. ALTITUDE, MAINTAIN 2550 R.P.M. AND 41 IN. HG. MANIFOLD PRESSURE WITH MIXTURE SET A.R.

LEGEND

ALT.: PRESSURE ALTITUDE
M.P.: MANIFOLD PRESSURE
G.P.H.: U.S. GALLONS PER HOUR
T.A.S.: TRUE AIR SPEED
KTS.: KNOTS
S.L.: SEA LEVEL
A.R.: AUTO RICH
A.L.: AUTO LEAN
F.T.: FULL THROTTLE
G.R.: GEAR RATIO

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSTE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ R.P.M., MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.


NAVY
33958
XF5U-1